

integration, to identify many of the products with derivatives of these bases. But, as the authors of the above monograph state:—

“The constitution of an alkaloid cannot be regarded as definitely ascertained until it has been artificially prepared in accordance with the formula and identified with the natural product.”

It is this last synthetic process which calls for the utmost resource and skill of the experimenter. The success which accompanied Hofmann's researches only served to emphasise the difficulties of the final synthetic stage. In spite of the magnitude of the task, Ladenburg accomplished the complete synthesis of coniine (the active principle of hemlock) in 1886. This was followed by Hantzsch's synthesis of trigonelline in the same year, and of piperine by Ladenburg in 1894. Perhaps the most brilliant of recent achievements in this region of research are the syntheses of the tropine alkaloids (atropine, cocaine, tropacocaine) by Willstätter, laudanose, papaverine, and nicotine, by Pictet, and the purine bases by E. Fischer.

As it is improbable that any known alkaloid exceeds in complexity those the synthesis of which has been accomplished, it may be safely predicted that sooner or later all will be produced artificially. Interesting as this record is of past results and future promise, the real significance of these discoveries is much more far-reaching; for the peculiar physiological properties of the alkaloids has led directly to the study of the relation of atomic grouping to physiological action. The ceaseless activity which has been displayed in this direction, especially in the German laboratories, has thrown so much light on the subject that new drugs are constantly produced the therapeutic action of which closely imitates that of the natural product. This vast and ever-increasing mass of new observations has already been carefully compiled in a treatise by Pictet, and in several monographs by Schmidt.

With the exception of one chapter on the source and significance of the alkaloids in plant-life, to which reference is made below, there is nothing in the present volume which can be said to supersede those named. Like the latter, it is a compilation of the more important facts systematically arranged and brought up to date; but there is no attempt at literary embellishment, which renders Pictet's book so readable, nor are those full references given, which are indispensable in a book of this nature, and form so important a feature in its predecessors. The concluding chapter on the origin of the alkaloids in the plant is the most interesting in the book, not because it throws much new light on the problem, but rather because it reveals the enormous difficulties which surround it. The authors rely on the proteins for their raw material, which, it is well known, contain no pyridine, quinoline, or isoquinoline constituent. For these nuclei they have recourse to such protein products as lysine and arginine, which can conceivably be fused into rings and bring to their aid formaldehyde, and its reduction and oxidation products, methyl alcohol, and formic acid for further elaborating these simpler ring compounds. Theorising is a necessary part of every progressive science, and no fault need

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be found with the authors if they like to exert their ingenuity on so fascinating a theme. At the same time, it may be pointed out that, if protein materials are to be taken as the starting point, the origin of such compounds as tyrosine and tryptophane affords difficulties quite as great as those which surround the natural synthesis of the alkaloids. J. B. C.

PRACTICAL GARDENING.

Manual of Gardening. A Practical Guide to the Making of Home Grounds, and the Growing of Flowers, Fruits, and Vegetables for Home Use. By L. H. Bailey. Pp. xvi+539. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1910.) Price 8s. 6d. net.

PROF. BAILEY is already very well known to readers in this country as the author of numerous works upon various branches of scientific horticulture. His greatest work is a “Cyclopædia of American Horticulture,” in several large volumes, and containing an immense amount of information on American garden plants, contributed by a large number of specialists. The present work, though far less ambitious, will be found extremely useful to gardeners in the States, even to those with very little experience, for the author, specialist as he is, finds no difficulty in writing upon garden subjects in a manner easily understandable by amateurs.

In a large measure the work is a combination and revision of two former volumes, “Garden Making” and “Practical Garden Book,” and it constitutes a guide to the making of home grounds, and the growing of flowers, fruits, and vegetables for home use.

Gardening in the States is not so general or technical as it is in our own country, and most of those who attempt to practise it find a great difficulty at the very outset, for they have few good models available to inspire them with correct ideas. In a large number of instances the formal method of design and planting is given preference, and the ordinary formal garden in America has most of the blemishes such gardens possess at home, but few of the virtues that characterise this system of landscape gardening at its best. There are certain instances of first-rate formal gardening in America, but, as the author of “The American Flower Garden” pointed out recently, the public has seldom the opportunity to inspect them.

Prof. Bailey's advice on the formation of gardens is therefore very opportune, for whilst he does not show himself as a partisan of either of the opposed methods, he explains carefully and in great detail how to make the best use of both by adopting them to the special circumstances of site, aspect, altitude, soil, and climate. Having discussed the “point of view” with regard to laying out the garden and planting it, the author proceeds to relate in detail the treatment of the more important species of plants. The chapter on the protection of plants from things that prey upon them (pests) is unusually valuable, for Prof. Bailey has a rare experience of the subject. Chapters ix. and x. deal respectively with fruit and vegetables, and on these subjects cultural details are supplied on almost every crop. The crops are much the same as

our own; indeed, the fruit crops are identical, whilst all our well-known vegetables are included amongst those cultivated in America, but there are some which are not familiar to us, including such as the sweet-potato, Rutabaga (a kind of turnip), watermelon, pepper, and okra. The okra is a plant belonging to the cotton family, and the green pods are used for making the well-known gumbo soup common in the southern States. The pods are also used for stews, and they are preserved by drying for use in winter.

The book concludes with a chapter containing cultural reminders for every month in the year, both for the northern and southern States, the requirements differing somewhat widely owing to the great differences in the climate.

The volume is freely illustrated, and it contains twenty-five plates which are reproductions from photographs. Beyond these there are numerous illustrations in the text, most of them from sketches, and, taking them generally, they are very inferior, the figures of apples and other fruits being particularly inadequate and disappointing.

A TREATISE ON BRITISH NUDIBRANCHIATE MOLLUSCA.

A Monograph of the British Nudibranchiate Mollusca, with Figures of the Species. Text by Sir Charles Eliot, K.C.M.G. Figures by the late Joshua Alder and the late Albany Hancock and others. Part viii. (Supplementary). Pp. vi+197+8 plates. (London: The Ray Society and Dulau and Co., 1910.) Price 25s. net.

THIS "supplement" to a work issued half-a-century ago has been admirably conceived and written by the Vice-Chancellor of Sheffield University. Alder and Hancock's classic monograph is known to every marine zoologist, and fifty years of research and criticism have found scarcely one weak place or error in that accurate and beautiful treatise. The authors, however, had accumulated certain addenda which they would probably have eventually published in the present form of a supplement. They knew that certain of their descriptions were not sufficiently full or were not based on a sufficiently large number of specimens to be final. Moreover, two generations of zoologists could scarcely fail to add new forms to a fauna that was published between 1845 and 1855, or to discover new points in the natural history and anatomy of these attractive mollusca. Hence the need for the present volume, and hence its matter. The illustrations are largely drawn by Alder and Hancock, and have been kept, in the long interval since they were made, in the Hancock Museum at Newcastle-on-Tyne. Sir Charles Eliot has had them reproduced and added to. His long and extensive acquaintance with the subjects and its literature in many lands has qualified him to write a text that shall worthily compare with that of the seven previous parts. The result is one upon which the author and the Ray Society may be warmly congratulated.

Few occurrences make such a pleasurable impression upon a zoologist as one's first encounter with a member of this group of animals. On turning over

a stone from the heap that lies covered by laminarian fronds, a grey, slimy object disengages itself from the rich animal undergrowth, and on transference to a vessel of water, straightens out its foot, erects its sensitive "feelers," and waves its serried "cerata." The slimy blob has become a superbly coloured eolis, or an *Aegirus punctilucens*, with coloured light emanating from the sparkles on its mantle. Such a transformation is not readily forgotten, and when the attraction of nudibranchs has once been felt, it is not easy to resist the temptation to investigate so many of these creatures as can be examined in a state of nature. The search for them takes one into the rich pastures of the sea, and here they must be found only by acquaintance with the special haunts of each several kind. The sea, like the land, has its seasons of plenty and of poverty. In winter and early spring few nudibranchs are to be found in the laminarian beds, where later they will abound. A few *Doris*, perhaps, no two alike in colouring, and an *Eolidia papillosa*, may be found gnawing the base of a sea-anemone or winding that pink gelatinous band of eggs which is to people the water with quaint free-swimming larvæ. But as spring comes, the nudibranchs increase in number, and proceed at once with the great business of procreation. The hydroids, sponges, or alcyonium are the special resorts of *Doto*, *Doris*, and *Tritonia*. Others affect sea-weeds, and are scarcely to be detected in the axils of their food-plant. One kind, a glutton, is found only on the eggs of certain fish. Another eats out the soft parts of a sea-squirt, and then lies buried in the eviscerated tunic. Altogether in the British area there are more than a hundred species, a synopsis of which forms the last portion of this work.

The mode of treatment may be shortly summarised. First comes a chapter on variation and distribution. In colour particularly nudibranchs offer a considerable range of variation, in part due to food, in larger part to light-factors that have as yet not been examined. Age differences between individuals of the same species introduce another source of diversity, and the phenomena of autotomy among Eolids is a further cause of discrepancy. With regard to distribution, Sir Charles Eliot summarises a great mass of evidence in a few pages. The most salient facts are the similarity of the nudibranch faunas in the northern and southern parts of the Atlantic, the similarity of the nudibranchs in the North Atlantic and North Pacific Oceans, and the distinctness of a tropical fauna in the intermediate zone.

"It is interesting to see that the waters of the South Atlantic beyond the tropics contain forms very similar to those found in the north, if not identical with them" (p. 11).

Eolids appear to be preponderant in Arctic and Antarctic waters, *Doris* in tropical waters. With regard to the vexed question of nomenclature, Sir Charles takes up a position intermediate between the "lumpers," such as Alder and Hancock, and the "splitters," such as Bergh, and he has many valuable remarks on the synonymy of the more difficult species. Two interesting chapters follow on the bionomics and